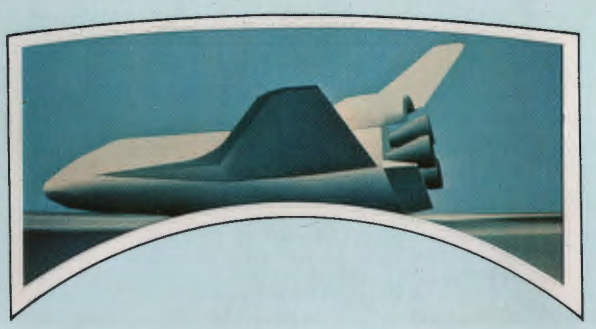
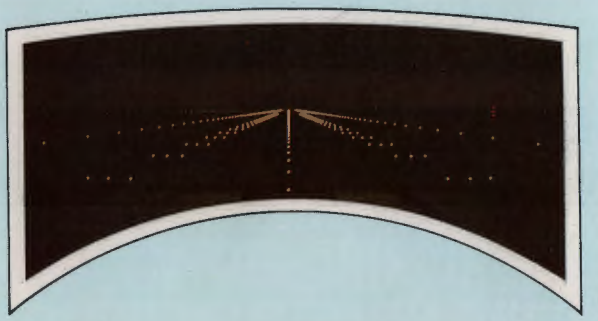
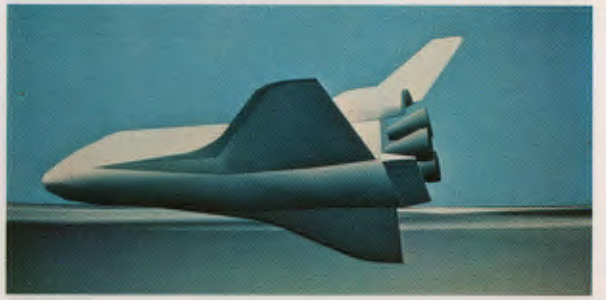
A complete family of visual systems by **LINK,** a Division of The Singer Company





VISULINK

Visual Display Systems*



Visulink* Visual Display Systems *encompass a broad spectrum of visual simulation. In fact, they are the largest family of such systems available today. There's one to meet everyone's training requirements.*
Indicative of the wide range of visual simulation provided by Link are the three systems described herein. Each represents a significant step forward in the state of the arts.

Visulink* Full/Scan Digital Image Generator
This furnishes computer-calculated imagery faithfully representing the view from any aircraft or from any other vehicle—from submarine to satellite.

Visulink* High Resolution/Camera Model Visual Display System
This employs a large terrain model and closed-circuit color television to furnish infinity displays which are strikingly realistic, even at close range.

Visulink* Point/Scan Night Visual System
This employs more than 6,000 light points to furnish computer-generated night scenes in color, complete with horizon glow and runway surface and markings.

A complete family of visual systems by **LINK**, a Division of The Singer Company

*A Trademark of The Singer Company

Visulink High Resolution/Camera Model Visual Display System

The **Visulink** High Resolution/Camera Model Visual Display System capitalizes on the latest technological advances in the field of electro optics to meet the most exacting training requirements.

Unlike conventional systems which use commercial low-resolution television cameras and displays and terrain models which lose realism at close range, the **Visulink** system produces highly realistic scenes regardless of altitude.

This is accomplished by using a high-detail terrain model scanned by a high resolution color camera coupled to a wide angle, servo-driven Scheimpflug-corrected optical probe specifically developed for this system.

The model board is fashioned painstakingly, with rigorous adherence to correct scale factors so trainees can properly judge altitude, altitude rates, slant ranges, closure rates, etc.

Latest high fidelity modeling techniques produce exceedingly accurate detail, making the system well suited for helicopter training—including nap-of-the-earth operations below tree-top level.

A high scale factor, such as 1,500:1, increases the flying area without sacrificing detail—even individual trees stand up to close inspection.

Instructor controls permit adjustment of terrain model illumination to simulate day, dusk or night.

To meet exacting training requirements Link developed a highly sensitive, high resolution TV camera. It uses three SEC vidicons to provide relatively low resolution color information and a new two-inch intensified vidicon to provide high resolution luminance information. The use of four image-tubes minimizes misregistration problems and reduces the number of wide bandwidth channels to one, thereby increasing system reliability. The result is a cost effective color camera which requires less day-to-day maintenance than conventional three-tube cameras.

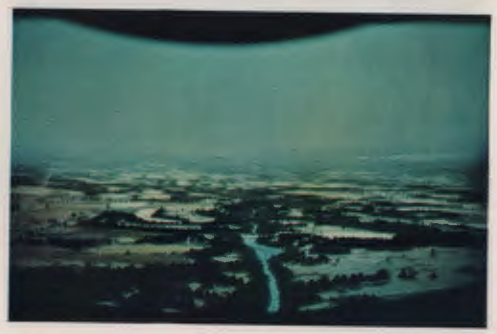
Link's high resolution television chain generates approximately 960,000 picture elements—four times as many as conventional systems—greatly increasing the ability to display imagery of high clarity and detail.

Contributing to this clarity is the optical probe which employs a complex and highly advanced system of optical correction, known as Scheimpflug. This preserves sharp focus down to simulated eye heights of 10 feet and permits "flying" close to vertical objects. The system is so flexible that it can operate in rugged, high-relief terrain, with sharp elevation changes of as much as 1,500 feet.

Aircraft attitudes are simulated by the probe; e.g., pitch is represented by tilting a mirror at the probe's entrance pupil and heading is simulated by rotating the pitch prism about the optical axis.

Each pilot's window has a color CRT monitor viewed through a beam-splitter and spherical mirror; the latter collimates the images so the scene appears to be at infinity throughout the range of normal head movement.

The system is used by the U.S. Air Force and U.S. Army for training fighter and helicopter pilots.



Visulink Point/Scan Night Visual System

The **Visulink** Point/Scan Night Visual System (NVS) is a compact simulator attachment which provides computer-generated night scenes in full color. NVS presents a complete night visual operating environment, including a realistic dynamic representation of the landing light lobe area of coverage.

The system incorporates technological advances which make it twice as bright as other computer-based night visual systems.

The visual image is further enhanced by the fact that the picture has an update speed of 30 cycles per second which makes flickering virtually imperceptible.

Various airport scenes are furnished through computer programming. Enhancing the scenes are a realistic horizon glow and as the simulator approaches the touchdown point the runway surface texture and markings become visible.

Limited visibility and cloud effects can be inserted by the instructor. Light simulation includes real-world effects such as bi-directionality, strobing, flashing and rotation.

The system makes provision for 16 on-line data bases, each with a capacity of more than 6,000 light points in seven colors. The data bases are stored on "floppy" disks, accessible in less than two seconds.

Additional data bases, on punched cards which are easily loaded, can be obtained from the Link library. New data base masters for any airport can be custom made by Link or the user can create his own, with the aid of computer input devices and suitable source data.

The card reader supplied with the basic system allows the user to modify or update each airport scene.

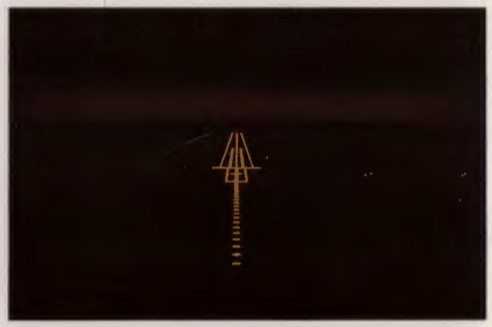
Each data base permits location of light points anywhere within an area of 170 by 170 nautical miles, making possible extensive lighting surrounding the airport.

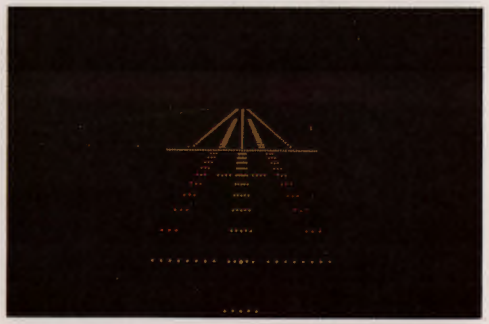
Each airport data base can be assigned to any ILS/GCA radio facility within the simulator computer; selection of an airport ILS channel therefore automatically calls up the correct visual scene.

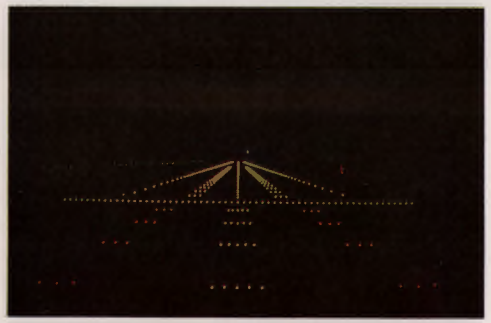
NVS is modular so the basic two-window system can easily be expanded to as many as eight windows, providing side-window visual scenes for circling maneuvers and special vertical/horizontal configurations for helicopters or other applications.

The system can also be used for aircraft carrier training. The surface texture of the deck is shown, along with the deck edge, centerline and appropriate shipboard lights.

NVS can be integrated with virtually any flight simulator and is being widely used by commercial airlines.







Visulink Full/Scan Digital Image Generator




The **Visulink** Full/Scan Digital Image Generator System (DIG) produces 1,000-line computer-composed color scenes for a wide range of training applications.

Thanks to the flexibility of digital technology, DIG is capable of generating a wide variety of operational views, involving not only aircraft but also other vehicles, including ships, submarines, tanks and spacecraft. Virtually all applications for visual systems in the training environment can be supplied by DIG.

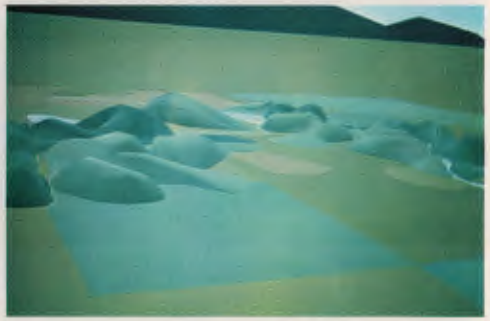
Used with an aircraft simulator, DIG can perform such demanding tasks as low level flight over rolling countryside, with terrain avoidance and terrain following.

It also is being used for such sophisticated assignments as the U.S. Space Shuttle simulator where it depicts the earth below, the payloads in the cargo bay and the operation of the remote manipulator arm.

DIG works from data bases containing the locations of edges of such objects as aircraft runways and their markings, buildings, roads, rivers and fields. It constructs scenes in which the objects are fully colored in and displayed in true perspective as the onlooker moves through the scene.

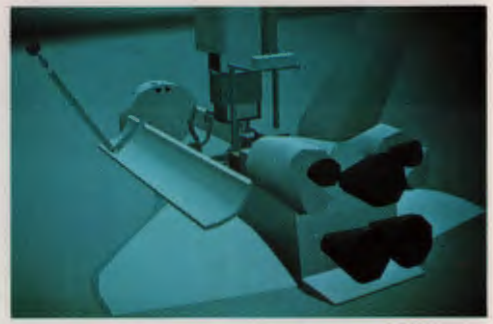
Operating in "real time," DIG can react to changes in the pilot's path in as little as 1/16 of a second, producing visual scenes with the same 30-per-second frame rate as commercial television.

Although objects are described by edges, they need not look flat-faced. A smooth-shading feature blends the intensities across objects, imparting a delicately varying shading which changes the flat facets into a single smooth rounded contour.



Low, grassy hills, simulated with the smooth shading feature, serve as a training ground for terrain following operations.

Shuttle model not only flies like an aircraft but also, with cargo bay doors open and satellite payload in place, trains astronauts in cargo manipulation with the remote arms.



Objects respond to the illumination of the "sun," brightening on the side toward the light and darkening on the opposite side. As the sun or object moves, the shading shifts appropriately.

DIG solves the problem of hidden surfaces. When one object goes behind another it is hidden just as it would be in real life.

DIG can show not only solid objects but also point lights, which can be made to flash, rotate, strobe or be seen from only one direction; two-dimensional ground patterns; and even fine lines. All retain their continuity and shape as they recede into the distance.

Realistic visibility effects can be introduced. The scene can be immersed in fog or haze, of desired densities, which makes them fade away into the distance. Cloud tops and bottoms can be simulated, along with the "breakout" that a pilot experiences as he drops beneath the cloud bottom. Distinct individual clouds can also be modelled, including towering cumulonimbus or thunderheads. All retain their shape and identity as the pilot flies toward them and then into them, with appropriate white-out effects.

High-density DIG scene of downtown Las Vegas demonstrates proper occulting of hidden surfaces, even when many overlap at once.

Perhaps the most outstanding feature of DIG is its high scene density. In terms of edges or face boundaries it's by far the most dense available today. This advantage is especially noticeable in the presentation of cultural detail, such as that representing a high population area.

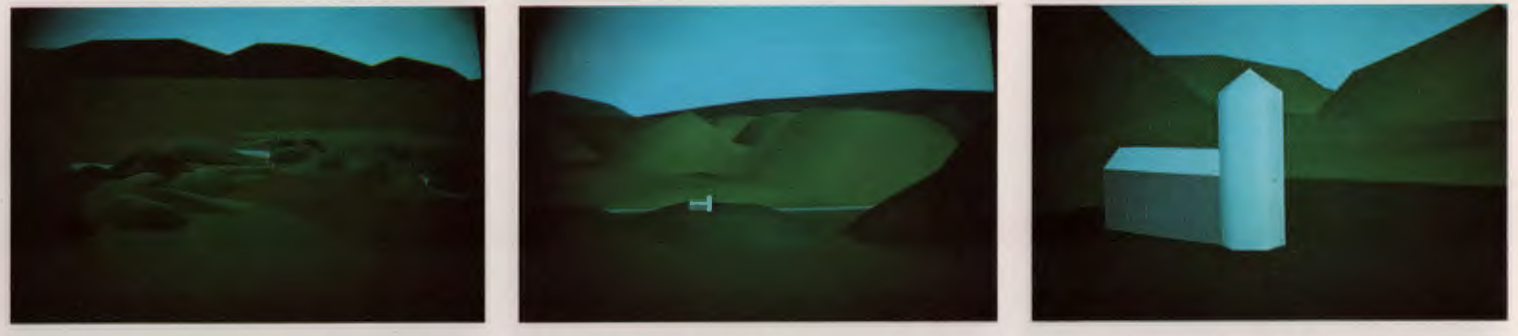
Dusk landing scenes blend lights with three-dimensional objects and layers of superimposed ground markings. Gradual darkening of unlighted objects is readily accomplished.

This ability to process dense scenes is backed up by a magnetic disk access system that allows scene detail to be picked up gradually as the pilot flies along and dropped as it falls behind him, so only that detail in the immediate viewable vicinity loads the system.

DIG also has provisions for combatting the distracting effects commonly observed with computer image generation systems. Edge smoothing, both horizontal and vertical, is employed to eliminate the rastering or shearing noticeable in early systems as objects move past television scanlines. Anti-scintillation methods are employed to reduce the breakup of fine lines and small, pin-point objects, which ordinarily tend to flicker and pulsate as they move through scanlines.

DIG can generate more than a million picture elements—each with its own color and shading—in each scene. To do this at the normal rate of 30 television frames a second requires extremely fast circuits in the final stages of the process, when picture elements are produced at the rate of one every forty-millionth of a second.

The **Visulink** Full/Scan Digital Image Generator System is one of the most versatile training devices ever devised. Its full potential has yet to be realized.



Closeups of grassy hills show the sharp detail as a terrain following flight brings even small buildings into the foreground.

Nearly 50 Years of Experience

Link is the world's most experienced producer of sophisticated training systems.

The organization, which dates back nearly half a century, has been producing visual display systems of varying types and complexities since 1942. This diversity of experience provides a solid foundation of expertise for meeting today's increasingly complex visual requirements.

Link Provides Full Support

Link backs the simulation systems it sells with full support — around the clock, around the world.

Experienced personnel are stationed in many countries, ready to install and maintain equipment. Link cooperates with customers in analyzing facilities and requirements so as to make recommendations for spares provisioning. Emergency replacement parts are quickly provided, assuring maximum utilization of training systems.

Link

A DIVISION OF THE SINGER COMPANY

LP7576-4M-9-76 Printed in U.S.A.